

JCO7 Rec'd PCT/PTO 19 MAR 2002

FORM PTO-1390 (REV 10-94)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			9424.173USWO
			U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) Unknown <b>10/088579</b>
INTERNATIONAL APPLICATION NO. PCT/NL00/00669	INTERNATIONAL FILING DATE September 20, 2000	PRIORITY DATE CLAIMED September 20, 1999	
TITLE OF INVENTION WASTE-WATER PURIFICATION IN CATTLE-BREEDING SYSTEMS			
APPLICANT(S) FOR DO/EO/US Adriaan Johannes Hubertus VAN DER WIJNGAART			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.			
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(I).</li> <li>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))               <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)</li> </ol> </li> <li>6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))               <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input type="checkbox"/> have been transmitted by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input checked="" type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An unsigned oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).</li> <li>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</li> </ol>			
<b>Items 11. to 16. below concern document(s) or information included:</b>			
11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.			
12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.			
13. <input checked="" type="checkbox"/> A FIRST preliminary amendment with a Marked-up Copy of Claims and Abstract. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.			
14. <input type="checkbox"/> A substitute specification.			
15. <input type="checkbox"/> A change of power of attorney and/or address letter.			
16. <input checked="" type="checkbox"/> Other items or information: Application Data Sheet, Form PCT/IPEA/408, International Publication Page, Form PCT/ISA/210			

U.S. APPLICATION NO (If known, see 37 CFR 1.5) <b>Unknown 10/088579</b>		INTERNATIONAL APPLICATION NO PCT/NL00/00669		ATTORNEY'S DOCKET NUMBER 9424.173USWO	
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17. <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492(a) (1)-(5)):</b> Search Report has been prepared by the EPO or JPO.....\$890.00  International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1)).....\$710.00  No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$740.00  Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(3)) paid to USPTO ..... \$1040.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) .....\$100.00				<b>CALCULATIONS</b> PTO USE ONLY	
<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				\$890.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	22                      -20 = 2		X \$18.00	\$36.00	
Independent claims	1                              -3 = 0		X \$80.00	\$0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$260.00	\$
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$926.00	
Reduction by 1/2 for filing by small entity, if applicable. Small entity status is claimed pursuant to 37 CFR 1.27				\$463.00	
<b>SUBTOTAL =</b>				\$463.00	
Processing fee of \$130.00 for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+ \$	
<b>TOTAL NATIONAL FEE =</b>				\$463.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+ \$	
<b>TOTAL FEES ENCLOSED =</b>				\$463.00	
				Amount to be: refunded	\$
				charged	\$

a. ☒ Check(s) in the amount of \$463.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
 A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
 overpayment to Deposit Account No. 13-2725.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO  
 John J. Gresens  
 MERCHANT & GOULD  
 P.O. Box 2903  
 Minneapolis, MN 55402-0903

SIGNATURE:

NAME: John J. Gresens

REGISTRATION NUMBER: 33,112

10/088579

IC10 Rec'd PCT/PTO 19 MAR 2002

S/N unknown

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	VAN DER WIJNGAART	Docket No.:	9424.173USWO
Serial No.:	unknown	Filed:	concurrent herewith
Int'l Appln No.:	PCTNL0000669	Int'l Filing Date:	September 20, 2000
Title:	WASTE-WATER PURIFICATION IN CATTLE-BREEDING SYSTEMS		

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number: EV 072821544 US

Date of Deposit: March 19, 2002

I hereby certify that this correspondence is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

By: 

Name: Chris Stordahl

PRELIMINARY AMENDMENT

Box PCT  
Assistant Commissioner for Patents  
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment, based on claims amended in prosecution of the international application and published in the International Preliminary Examination Report, a copy of which is enclosed herewith:

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

A courtesy copy of the present specification is enclosed herewith. However, the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

## IN THE CLAIMS

Please amend claims 3-11, 13, 14, 18-20 and 22 to read as follows:

3. (AMENDED) A method according to claim 1, wherein the microorganism containing effluent is split by means of a membrane into a microorganism enriched stream to be largely re-circulated and a stream substantially free of microorganisms.
4. (AMENDED) A method according to claim 1, wherein microorganism containing effluent of the aerated section is split into a microorganism enriched stream to be largely re-circulated and a stream reduced in microorganisms via a preseparator and membrane filtration.
5. (AMENDED) A method according to claim 1, wherein at least a flat membrane is used, and behind the membrane a reduced pressure prevails.
6. (AMENDED) A method according to claim 1, wherein at least a part of the biomass is used for washing contaminated air originating from a stable for intensive stock farming.
7. (AMENDED) A method according to claim 1, wherein salt-containing purified waste water, after separation of the biomass and optional separation of other contaminants and/or concentration, is used for drying and/or decontamination of contaminated air originating from a stable for intensive stock farming.
8. (AMENDED) A method according to claim 1, wherein salt-containing purified waste water, after separation of the biomass and optional separation of other contaminants and/or concentration, is electrolytically treated, thereby splitting the salt into acid and base.
9. (AMENDED) A method according to claim 1, wherein heat originating from the waste-water purification is used for drying materials.

10. (AMENDED) A method according to claim 1, wherein supplying the effluent of the non-aerated section to the aerated section comprises the flowing of the effluent of the non-aerated compartment of a reactor to an aerated compartment of the reactor via an action of communicating vessels.

11. (AMENDED) A system for purifying waste water utilizing the method according to claim 1, comprising a biological waste water purification plant with a non-aerated section and an aerated section, means for re-circulating at least the greater part of the microorganisms and at least a part of the effluent of the aerated section to the non-aerated section, and means for separating at least a part of the effluent with the aid of a membrane filtration.

13. (AMENDED) A system according to claim 11, wherein the non-aerate section and the aerated section are each a compartment of a reactor which is arranged such that the reactor enable the waste water to flow from the non-aerated section to the aerated section via an action of communicating vessels.

14. (AMENDED) A system according to claim 11, comprising at least a stable for keeping cattle, with means being present for substantially preventing the formation of ammonia through contact of solid manure and urine by separation into a solid and a liquid phase, which liquid phase is supplied to the non-aerated section of the waste-water purification plant, which system further comprises means for the at least partial reprocessing of the solid and/or the liquid phase into useful products.

18. (AMENDED) A system according to claim 11, wherein the waste-water purification one or more tubes are arranged through which the material to be dried can be conveyed, which material is dried by heat exchange with the hot waste water.

22. (AMENDED) A system according to claim 11, wherein the stable is implemented as a conventional system or a modular system of boxlike modules with mobile receiving module.

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claims 3-11, 13, 14, 18-20 and 22.

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice.

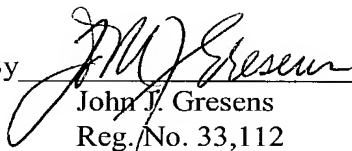
Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, John J. Gresens (Reg. No. 33,112), at (612) 371.5265.

Respectfully submitted,

MERCHANT & GOULD P.C.  
P.O. Box 2903  
Minneapolis, Minnesota 55402-0903  
(612) 332-5300

Dated: March 19, 2002

By   
John J. Gresens  
Reg./No. 33,112

JJG/pjk

**ABSTRACT**

The invention relates to an integrated stock farming system, comprising at least a stable for keeping cattle, wherein means are present for substantially preventing the formation of ammonia through contact of solid manure and urine by separation into a solid and a liquid phase, which system further comprises means for at least partly reprocessing the solid and/or the liquid phase into useful products.



MARKED-UP COPY OF CLAIMS

3. A method according to claim 1 [or 2], wherein the microorganism containing effluent is split by means of a membrane into a microorganism enriched stream to be largely re-circulated and a stream substantially free of microorganisms.
4. A method according to claim 1 [or 2], wherein microorganism containing effluent of the aerated section is split into a microorganism enriched stream to be largely re-circulated and a stream reduced in microorganisms via a preseparator and membrane filtration.
5. A method according to [claims 1-4] claim 1, wherein at least a flat membrane is used, and behind the membrane a reduced pressure prevails.
6. A method according to [claims 1-5] claim 1, wherein at least a part of the biomass is used for washing contaminated air originating from a stable for intensive stock farming.
7. A method according to [claims 1-6] claim 1, wherein salt-containing purified waste water, after separation of the biomass and optional separation of other contaminants and/or concentration, is used for drying and/or decontamination of contaminated air originating from a stable for intensive stock farming.
8. A method according to [claims 1-6] claim 1, wherein salt-containing purified waste water, after separation of the biomass and optional separation of other contaminants and/or concentration, is electrolytically treated, thereby splitting the salt into acid and base.
9. A method according to [claims 1-8] claim 1, wherein heat originating from the waste-water purification is used for drying materials.
10. A method according to [any one of the preceding claims] claim 1, wherein supplying the effluent of the non-aerated section to the aerated section comprises the flowing of

the effluent of the non-aerated compartment of a reactor to an aerated compartment of the reactor via an action of communicating vessels.

11. A system for purifying waste water utilizing the method according to [any one of claims 1-10] claim 1, comprising a biological waste water purification plant with a non-aerated section and an aerated section, means for re-circulating at least the greater part of the microorganisms and at least a part of the effluent of the aerated section to the non-aerated section, and means for separating at least a part of the effluent with the aid of a membrane filtration.

13. A system according to claim 11 [or 12], wherein the non-aerate section and the aerated section are each a compartment of a reactor which is arranged such that the reactor enable the waste water to flow from the non-aerated section to the aerated section via an action of communicating vessels.

14. A system according to [any one of claims 11-13] claim 11, comprising at least a stable for keeping cattle, with means being present for substantially preventing the formation of ammonia through contact of solid manure and urine by separation into a solid and a liquid phase, which liquid phase is supplied to the non-aerated section of the waste-water purification plant, which system further comprises means for the at least partial reprocessing of the solid and/or the liquid phase into useful products.

18. A system according to [claims 11-17] claim 11, wherein the waste-water purification one or more tubes are arranged through which the material to be dried can be conveyed, which material is dried by heat exchange with the hot waste water.

19. A system according to [claims 11-18] claim 11, wherein the solid phase is further processed by fermentation and/or combustion and/or gasification, optionally combined with rendering the residue products inert by glazing/glass foaming.

20. A system according to [claims 11-19] claim 11, wherein one or more product streams, such as algae, duckweed, biomass and/or solid composted manure optionally in combination with other components, are used as feed.

22. A system according to [claims 11-21] claim 11, wherein the stable is implemented as a conventional system or a modular system of boxlike modules with mobile receiving module.

10/088579

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: VAN DER WIJNGAART

JC10 Rec'd PCT/PTO 19 MAR 2002

Docket: 9424.173USWO

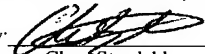
Title: WASTE-WATER PURIFICATION IN CATTLE-BREEDING SYSTEMS

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number. EV 072821544 US

Date of Deposit March 19, 2002

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By:   
Name: Chris Stordahl

BOX PATENT APPLICATION

Commissioner for Patents  
Washington, D.C. 20231

Sir:

We are transmitting herewith the attached:


- ☒ Transmittal sheet, in duplicate, containing Certificate under 37 CFR 1.10.
- ☒ National Stage PCT Patent Application: Spec. 11 pgs; 22 claims.  
The fee has been calculated as shown below in the 'Claims as Filed' table.
- ☒ 4 sheets of formal drawings
- ☒ Small entity status is claimed pursuant to 37 CFR 1.27
- ☒ An unsigned Combined Declaration and Power of Attorney
- ☒ A check in the amount of \$463.00 to cover the Filing Fee
- ☒ Application Data Sheet, 3 pages.
- ☒ Other: Form PTO-1390, Preliminary Amendment with a Marked-up Copy of Claims and Abstract, Form PCT/IPEA/408/, Form PCT/ISA/210
- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed		In Excess of:		Number Extra		Rate		Fee
<b>Basic Filing Fee</b>								\$445.00
<b>Total Claims</b>								
22	-	20	=	2	x	9.00	=	\$18.00
<b>Independent Claims</b>								
1	-	3	=	0	x	42.00	=	\$0.00
MULTIPLE DEPENDENT CLAIM FEE								\$0.00
TOTAL FILING FEE								\$463.00

Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

MERCHANT & GOULD P.C.  
P.O. Box 2903, Minneapolis, MN 55402-0903  
(612) 332-5300

By:   
Name: John J. Gresens  
Reg. No.: 33/112  
Initials: JJG/pjk



(PTO TRANSMITTAL - NEW FILING)

200440579 10/088579

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: VAN DER WIJNGAART  
 Docket: 9424.173USWO  
 Title: WASTE-WATER PURIFICATION IN CATTLE-BREEDING SYSTEMS

1010 Rec'd PCT/PTO 19 MAR 2002

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number. EV 072821544 US

Date of Deposit: March 19, 2002

I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Commissioner for Patents, Washington, D C. 20231

By:   
 Name Chris Stordahl

BOX PATENT APPLICATION

Commissioner for Patents  
 Washington, D.C. 20231

Sir:

We are transmitting herewith the attached:

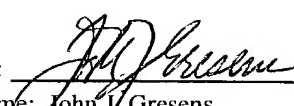
- ☒ Transmittal sheet, in duplicate, containing Certificate under 37 CFR 1.10.
- ☒ National Stage PCT Patent Application: Spec. 11 pgs; 22 claims.  
 The fee has been calculated as shown below in the 'Claims as Filed' table.
- ☒ 4 sheets of formal drawings
- ☒ Small entity status is claimed pursuant to 37 CFR 1.27
- ☒ An unsigned Combined Declaration and Power of Attorney
- ☒ A check in the amount of \$463.00 to cover the Filing Fee
- ☒ Application Data Sheet, 3 pages.
- ☒ Other: Form PTO-1390, Preliminary Amendment with a Marked-up Copy of Claims and Abstract, Form PCT/IPEA/408/, Form PCT/ISA/210
- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed		In Excess of:		Number Extra		Rate		Fee
Basic Filing Fee								\$445.00
Total Claims								
22	-	20	=	2	x	9.00	=	\$18.00
Independent Claims								
1	-	3	=	0	x	42.00	=	\$0.00
MULTIPLE DEPENDENT CLAIM FEE								\$0.00
TOTAL FILING FEE								\$463.00

Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

MERCHANT & GOULD P.C.  
 P.O. Box 2903, Minneapolis, MN 55402-0903  
 (612) 332-5300

By:   
 Name: John J. Gresens  
 Reg. No.: 33,112  
 Initials: JJG/pjk



(PTO TRANSMITTAL - NEW FILING)

## INTERNATIONAL SEARCH REPORT

Intern	1a) Application No
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PCT/NL 00/00669

**A. CLASSIFICATION OF SUBJECT MATTER**

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A01K1/01 A01C3/00 A01C3/02 C02F3/30

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A01K A01C C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	US 4 749 494 A (TOMOYASU) 7 June 1988 (1988-06-07)	1-3,9
Y	the whole document	10,11
Y	EP 0 498 084 A (VAN ASPERT BEHEER B.V.) 12 August 1992 (1992-08-12) abstract	10,11
A	EP 0 850 561 A (IMAGDLO) 1 July 1998 (1998-07-01) the whole document	1,9,15
A	NL 8 901 220 A (DE BOER B.V.) 17 December 1990 (1990-12-17) figure 3	10,13

-/-



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

<sup>a</sup> Special categories of cited documents

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*G\* document member of the same patent family

Date of the actual completion of the international search

17 January 2001

Date of mailing of the international search report

25/01/2001

Name and mailing address of the ISA

European Patent Office, P B 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer \_\_\_\_\_

von Arx, V.

## INTERNATIONAL SEARCH REPORT

Interr 1al Application No

PCT/NL 00/00669

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 30 49 302 A (VASILENKO) 19 August 1982 (1982-08-19) the whole document ----	1-18
A	US 3 982 499 A (FRANKL) 28 September 1976 (1976-09-28) ----	
A	US 5 833 856 A (LIU) 10 November 1998 (1998-11-10) ----	
A	US 4 121 539 A (MOORE) 24 October 1978 (1978-10-24) ----	
A	NL 9 200 763 A (DE CORTE) 16 November 1992 (1992-11-16) -----	

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 00/00669

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4749494 A	07-06-1988	DE 3679139 D EP 0217962 A WO 8605771 A JP 6032827 B KR 9307806 B	13-06-1991 15-04-1987 09-10-1986 02-05-1994 20-08-1993
EP 498084 A	12-08-1992	AT 137482 T DE 69119218 D DE 69119218 T DK 498084 T ES 2087960 T GR 3020582 T	15-05-1996 05-06-1996 28-11-1996 12-08-1996 01-08-1996 31-10-1996
EP 850561 A	01-07-1998	NL 1004887 C	02-07-1998
NL 8901220 A	17-12-1990	NONE	
DE 3049302 A	19-08-1982	CA 1161577 A FR 2500990 A SE 450769 B SE 8100076 A	31-01-1984 10-09-1982 27-07-1987 09-07-1982
US 3982499 A	28-09-1976	NONE	
US 5833856 A	10-11-1998	NONE	
US 4121539 A	24-10-1978	NONE	
NL 9200763 A	16-11-1992	NL 9100733 A AU 3096992 A DE 69220246 D DE 69220246 T DK 637907 T EP 0637907 A ES 2102530 T WO 9321758 A	16-11-1992 29-11-1993 10-07-1997 25-09-1997 29-12-1997 15-02-1995 01-08-1997 11-11-1993



4/P/12B

Title: Waste-water purification in cattle-breeding systems.

The present invention relates to a system of waste-water purification in cattle-breeding systems, more specifically in relation to manure processing, wherein the products to be produced from the manure are deployed as much as possible at the location where the residue is  
5 produced. This is mainly energy and water.

Domestic farming animals such as pigs, cows, horses, rabbits and furred animals produce urine and feces; chickens, by contrast, only produce solid manure.

Producing meat/eggs in the current production techniques has a  
10 great environmental impact when the discharge of residues from farming is involved. Air, soil and groundwater are subject to undue application of manure, so that the natural equilibrium is disturbed. In the current view, these residues are regarded as waste matter, but in the present invention, this waste is regarded as a raw material for a recycling process. The  
15 starting-point is that the waste is processed/treated so as to yield a product which, either at the farm direct, or indirectly, generates a surplus value for the producer of the waste. In the present invention, manure is regarded as "raw material" which, after being processed, yields an economic surplus value to the stock farms.

20 In intensive stock-farming, animals, such as cows, pigs, sheep, goats, chickens, furred animals, and the like, are housed on grids. The manure produced by the animals falls through the grid and is collected in a subjacent pit. The collected manure consists substantially of a combination of urine with solid manure. This mixture causes ammonia emission, both in  
25 the stable and when stored outside, which may lead to acidification. Also, it is undesirable for man and animals that in the housing/working space too high a concentration of ammonia gas is present. This may give rise to diseases of the lungs and liver and to reduced growth.

To obviate the problem, it is attempted to remove the manure mixture from the stable as fast as possible. This is done, for instance, by providing flushing drain/discharge drains, whereby any manure produced is discharged from the stable as fast as possible.

5 Another solution to this problem is found by keeping urine and feces separate on a conveyor belt. A belt arranged at a slant, or a spherically or semispherically shaped belt, causes the manure to run directly to the lowest point of discharge, either to a parallel discharge drain (drains) or along a drain integrally formed on the belt. The amazing attendant effect is  
10 that the enzymatic action is undone and through the absence of direct contact between manure and urine, no ammonia formation can arise.

Such a method already solves many problems, but what remains, obviously, is the necessity of the further processing of the residue streams, such as the solid manure constituents and the liquid manure constituents,  
15 but also the contaminated air from the stable. Further, there is an ongoing need for the furthest possible integration of the various processing systems.

Accordingly, the present invention concerns an integrated system for the purification of various residue streams of intensive stock farming, which are all grouped around the waste-water purification.

20 Accordingly, in a first embodiment, the invention provides a method for purifying waste water using microorganisms, preferably originating from an integrated stock farming system, which method comprises supplying waste water to a non-aerated section of a biological waste water purification plant, supplying the effluent of said non-aerated  
25 section to an aerated section, recirculating at least the greater part of the microorganisms and at least a part of the effluent of the aerated section to the aerated and/or the non-aerated section, and separating at least a part of the effluent using a membrane filtration.

In combination with this waste-water purification, an integrated system for a stable has been developed, which is based on the surprising insight that a far-reaching integration and compaction is possible.

If, accordingly, in the stable means are arranged that provide for  
5 an immediate separation of urine and solid manure, it becomes possible to reuse the various product (waste) streams from the stable, without necessitating unduly dimensioned and complicated operations (purifications).

The invention now provides an integrated system for stock  
10 farming, in which the material streams, gas, solids, liquid, coming from the stable can be reused in a useful manner.

In the broadest embodiment, the invention concerns a method for purifying waste water using microorganisms, preferably originating from an integrated stock farming system, which method comprises supplying waste  
15 water to a non-aerated section of a biological waste water purification plant, supplying the effluent of said non-aerated section to an aerated section, recirculating at least the greater part of the microorganisms and at least a part of the effluent of the aerated section to the aerated and/or the non-aerated section, and separating at least a part of the microorganisms  
20 using a membrane filtration, the content of microorganisms in the waste-water purification being preferably above 10 g/l.

The liquid manure streams coming from the stable can, after adequate processing, be converted to products that are suitable for reuse in the system. To be considered in this connection is, inter alia, the  
25 purification of the liquid fraction in a biological manner in a high-loaded biological purification plant (biological oxidation, nitrification + denitrification). This plant is preferably provided with means for separating the liquid from the biomass, for instance using membranes, rotor separator, sawdust filter, and the like. In any case, the plant is provided with a  
30 membrane filtration, with optionally a prior pre-purification, to relieve the

According to a preferred embodiment, a belt separator is placed under the stable, for instance a conveyor belt which separates the solid and liquid phases from each other. This separator can consist, for instance, of a

belt arranged at a slant, having on the low side a discharge drain for the liquid, or a belt whose central axis is higher than the sides, with discharge drains on either side.

If placing belt separators is not possible, it may suffice to separate  
5 the manure as soon as it is present in the pits. These pits (or silos) can be arranged both inside and outside the stables. The collected manure is separated as fast as possible into a thin and a thick manure fraction. The separation can be carried out through administration of polyelectrolyte, or not, and subsequently presenting this mixture to a separator device. This  
10 device can be a centrifuge, a rotary separator, a screw jack press, a screening bend, a cyclone, or any other known technique of separating solid and liquid streams.

The objective then is for the separated water to achieve a solids percentage of about 1.5-2%, while the dry manure achieves a percentage of  
15 25% by weight at a minimum. Obviously, deviations from this percentage are possible.

According to a preferred embodiment of the invention, a system for stock farming and manure reprocessing consists of a conventional stable or a modular stable, that is, an existing stable with a collecting provision and  
20 discharge for liquid and solid manure. The mixture of liquid and solid manure is conveyed out of the stable and separated in a centrifuge separator into a solid component and a liquid component. The latter component still contains a few percent of solids, which are separated in a settling provision, optionally after addition of coagulation auxiliaries.  
25 Thereafter the liquid is purified in a high-loaded nitrification/denitrification. The system of biomass and liquid circulates through a reaction system, while after the nitrification a part of the liquid is discharged via membranes. The remainder is recirculated to the reactor, for instance via sprinklers which also provide for the aeration.



The resulting materials can optionally be combined for further processing, for instance into feed. It is also possible to compost the manure, 30 whether or not after fermentation, and to dry the fermented and/or

mineralized solid manure stream and to subsequently burn it or, if desired after addition of glass and/or sand, glaze the manure, whereafter it can be dumped or be used otherwise. An alternative application can be the use as substrate for mushroom growing, if desired after suitable treatment to make  
5 the material useful therefor, such as mixing with moisture-regulating fibers (such as coir).

A particular embodiment of the invention consists in the mixing of the solid manure with glass powder and additives, such as water glass. From that mixture, granules are formed, which, after drying, are heated.  
10 The organic component of the manure is thereby combusted, and porous mineral granules are obtained which are free of bacteria and disease germs.

It is also possible for the manure to be burnt and for the ash residues, comprising inter alia phosphates and minerals, to be heated, together with glass and/or water glass and optionally other additives, to a  
15 temperature of at least 650°C, to form a porous glass matrix from which the minerals are slowly released over time.

The heat released upon the combustion in turn can be usefully employed, for instance as heating for the stable. The flue gases in turn can be cleaned through conventional techniques, for instance a rotary particle  
20 separator and the like.

Referring to the accompanying drawings, the invention will presently be elucidated. In Fig. 1 an example is given of the current situation of a stable. Fig. 2 shows a new concept of a stable, whereby a number of modular boxlike housings have been combined. Fig. 3 gives a  
25 schematic overview of a number of possibilities for integrating the various product streams.

In Fig. 1 the current housing situation in a stable with manure production is represented. A stable is, so to say, an elongate boxlike space in which at floor level a number of compartmental partitions have been made.  
30 The animals stand behind these partitions, on grids. From above, hot or



cooled air is introduced, which is discharged in the longitudinal direction along the grids.

The animals which are housed in the stable produce manure and urine which are collected in the collecting pit under the grids. According to the more modern systems, these products are rapidly discharged from the stable with flushing liquid to reduce ammonia emission.

In Fig. 2 a new implementation of a stable is shown, whereby a number of modular housings are combined with each other in the longitudinal direction, and which are also stackable. In these container-like housings, a manure removal system is placed, for instance a conveyor system.

In these modules, grid floors are placed along the entire width as well as along the entire length. This grid floor can be ridden out of the modules as a total unit including the animals housed on the grid. To that end, a second module is placed in front of the module to be emptied and it is fixedly positioned in front of the stationary module. By opening doors, the grid can subsequently be ridden from a stationary module and it can be displaced as desired to another module. As desired, either the entire grid or the animals are subsequently moved.

This concept also includes the possibility of using one or more modules in which mushroom growing is implemented based on residual substances from the system.

In Fig. 3 it is represented how the manure waste stream can be reused at the farm site. The embodiment to be eventually chosen depends on the specific choice of the techniques.

In Fig. 4 a number of aspects of the integrated systems according to the invention are schematically represented.

In the invention, the urine is passed from the separation device to the aeration reactor (if desired after prior chemicophysical treatment). This reactor is built up from two compartments which are separated from each

other by a partition, while an action of communicating vessels occurs. The water is introduced into the non-aerated zone and runs via a downward movement to the aerated compartment. The purified water is subsequently separated from the biomass via a membrane filter or rotary separator. The biomass is led back to the reactor and there divided between the aerated and non-aerated compartments.

After treatment of the waste water, the biomass can be harvested or be partly recirculated to the influent water stream, as desired. The choice depends on whether for the preparation of feed the biomass volume or the yield of the post-connected technical components is harvested.

It has been found that in the water particular hydrocarbon compounds occur as well as salts and nitrates. This water is eminently suitable as nutrient medium for algae or for the purification of the flue gases of a combustion step. The algae are capable, in combination with photosynthesis, of binding nitrates to form proteins and converting the hydrocarbon compounds. Dried algae are an important food.

In the above-described systems, various nutrient components are released.

The solid manure from the separator contains a number of organic substances, which can be anaerobically converted to methane gas. From a compact fermenter, therefore, biogas can be produced, which can supply a combined heating and power station. The produced energy and heat quantities can be usefully employed at the farm. The composted or fermented and mineralized solid manure stream can presently, as desired, be combined with the biomass from the aeration reactor, as well as be combined with the cultivated algae, duckweed and/or other nitrogen-fixing organisms from the compact reactor.

Depending on the desired composition of the various components, an additive can be supplied, such as molasses, starch, brewer's grains, or similar additives, such that nutrient rich mass is produced, which at the

same time provides for a drying. As a result, in a simple manner, through a small granule mincer, strands can be produced which can subsequently be further dried. Drying can take place through dry air, but there is also a possibility of passing the materials, by means of a conveyor screw, through  
5 a pipe in the water purification and thus to utilize the sensible heat of the waste water.

Investigation has shown that waste in the stable is not limited to manure streams, but that a considerable amount of CO<sub>2</sub> is produced by the animals in the stable in question. Thus, a pig weighing 100 kg will produce  
10 about 52.8 g of CO<sub>2</sub> per hour as well as an amount of heat.

The waste streams mentioned are responsible for a greenhouse effect in the environment.

By presently introducing the waste stream of the stables into reactors, both the heat quantity and the CO<sub>2</sub> quantity can be usefully spent,  
15 without deploying systems that cause greenhouse effects on two fronts. If desired, the heat can be converted to electricity, which can be usefully employed in the system.

The solid manure substances, as already indicated above, can be reused through another process, or be used as nutrient media and as garden  
20 mold, with the composted manure being mixed with coir fibers or other nutrient rich natural products. Coir fibers have a moisture-regulating action. Other types of fiber can also be used, as desired. It is also possible to utilize the glazed granules described herein in the system according to the invention.

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Claims

1. A method for purifying waste water using microorganisms, preferably originating from an integrated stock farming system, which method comprises supplying waste water to a non-aerated section of a biological waste water purification plant, supplying the effluent of said non-aerated section to an  
5 aerated section, re-circulating at least the greater part of the microorganisms and at least a part of the effluent of the aerated section to the non-aerated section, and separating at least a part of the microorganisms using a membrane filtration, the content of microorganisms in the waste-water purification being preferably above 10 g/l.
- 10 2. A method according to claim 1, characterized in that, at least the greater part of the microorganisms and at least a part of the effluent of the aerated section is also re-circulated to the aerated section.
3. A method according to claim 1 or 2, wherein the microorganism  
15 containing effluent is split by means of a membrane into a microorganism enriched stream to be largely re-circulated and a stream substantially free of microorganisms.
4. A method according to claim 1 or 3, wherein microorganism containing  
20 effluent of the aerated section is split into a microorganism enriched stream to be largely re-circulated and a stream reduced in microorganisms via a pre-separator and membrane filtration.
5. A method according to claims 1-4, wherein at least a flat membrane is used, and behind the membrane a reduced pressure prevails.
6. A method according to claims 1-5 wherein at least a part of the biomass  
25 is used for washing contaminated air originating from a stable for intensive stock farming.
7. A method according to claims 1-6 wherein salt-containing purified waste water, after separation of the biomass and optional separation of other contaminants and/or concentration, is used for drying and/or decontamination of contaminated air originating from a stable for intensive stock farming.

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8. A method according to claims 1-6, wherein salt-containing purified waste water, after separation of the biomass and optional separation of other contaminants and/or concentration, is electrolytically treated, thereby splitting the salt into acid and base.
- 5 9. A method according to claims 1-8, wherein heat originating from the waste-water purification is used for drying materials.
10. A method according to any one of the preceding claims, wherein supplying the effluent of the non-aerated section to the aerated section comprises the flowing of the effluent of the non-aerated compartment of a
- 10 reactor to an aerated compartment of the reactor via an action of communicating vessels.
11. A system for purifying waste water utilizing the method according to any one of claims 1-10, comprising a biological waste water purification plant with a non-aerated section and an aerated section, means for re-circulating at
- 15 least the greater part of the microorganisms and at least a part of the effluent of the aerated section to the non-aerated section, and means for separating at least a part of the effluent with the aid of a membrane filtration.
12. A system according to claim 11, further comprising means for also re-circulating at least the greater part of the microorganisms and at least a part
- 20 of the effluent of the aerated section to the aerated section.
13. A system according to claim 11 or 12, wherein the non-aerated section and the aerated section are each a compartment of a reactor which is arranged such that the reactor enable the waste water to flow from the non-aerated section to the aerated section via an action of communicating vessels.
- 25 14. A system according to any one of claim 11-13, comprising at least a stable for keeping cattle, with means being present for substantially preventing the formation of ammonia through contact of solid manure and urine by separation into a solid and a liquid phase, which liquid phase is supplied to the non-aerated section of the waste-water purification plant,

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which system further comprises means for the at least partial reprocessing of the solid and/or the liquid phase into useful products.

15. A system according to claim 14, wherein said means for substantially preventing the formation of ammonia consist of a separation system for  
5 separating solid components and liquid components, which separation system is arranged under the compartment for the animals or outside the stable.
16. A system according to claim 15, wherein said separation system consists of a plastic conveyor belt, whose central axis is higher than at least one of the sides, so that the liquid runs off laterally, while further a collection drain is  
10 present for collecting and discharging the liquid.
17. A system according to claim 16, wherein the means consist of a rotor separator, a screening bend, or a screw separator.
18. A system according to claims 11-17, wherein in the waste-water purification one or more tubes are arranged through which the material to be  
15 dried can be conveyed, which material is dried by heat exchange with the hot waste water.
19. A system according to claims 11-18, wherein the solid phase is further processed by fermentation and/or combustion and/or gasification, optionally combined with rendering the residue products inert by glazing/glass foaming.
20. A system according to claims 11-19 wherein one or more product  
20 streams, such as algae, duckweed, biomass and/or solid composted manure optionally in combination with other components, are used as feed.
21. A system according to claim 20, wherein solid manure components, whether or not after pre-treatment (fermenting, composting, mineralizing), are  
25 mixed with glass powder and optionally other additives, which mixture is subsequently converted into porous glass granules.
22. A system according to claims 11-21, wherein the stable is implemented as a conventional system or a modular system of boxlike modules with mobile receiving module.

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(71) Applicant and

(72) Inventor: **VAN DER WIJNGAART, Adriaan, Jo-**  
**hannes, Hubertus** [NL/NL]; Kapelstraat 40, NL-4841 GJ  
Prinsenbeek (NL).

(74) Agent: **PRINS, A., W.**; Vereenigde, Nieuwe Parklaan 97,  
NL-2587 BN The Hague (NL).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
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(57) Abstract: The invention relates to an integrated stock farming system, comprising at least a stable for keeping cattle, wherein means are present for substantially preventing the formation of ammonia through contact of solid manure and urine by separation into a solid and a liquid phase, which system further comprises means for at least partly reprocessing the solid and/or the liquid phase into useful products.

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Inventor: VAN DER WIJNGAARDT

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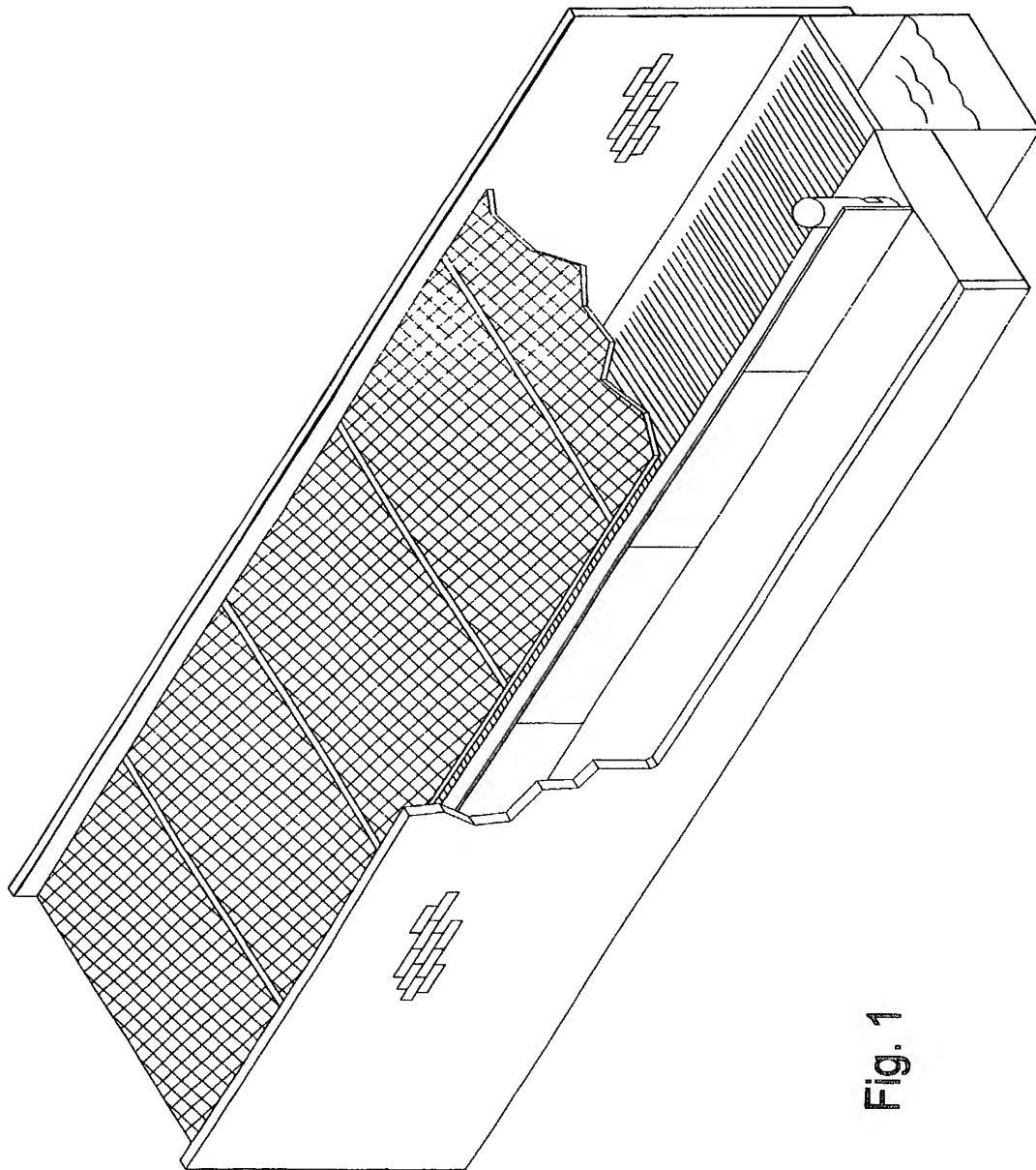


Fig. 1



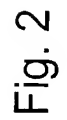


Fig. 2

$\frac{1}{2} \frac{\partial^2}{\partial t^2} + \frac{1}{2} \frac{\partial^2}{\partial x^2} - \frac{1}{2} \frac{\partial^2}{\partial y^2} - \frac{1}{2} \frac{\partial^2}{\partial z^2}$

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FEEDING SYSTEMS

## FEEDING SYSTEMS



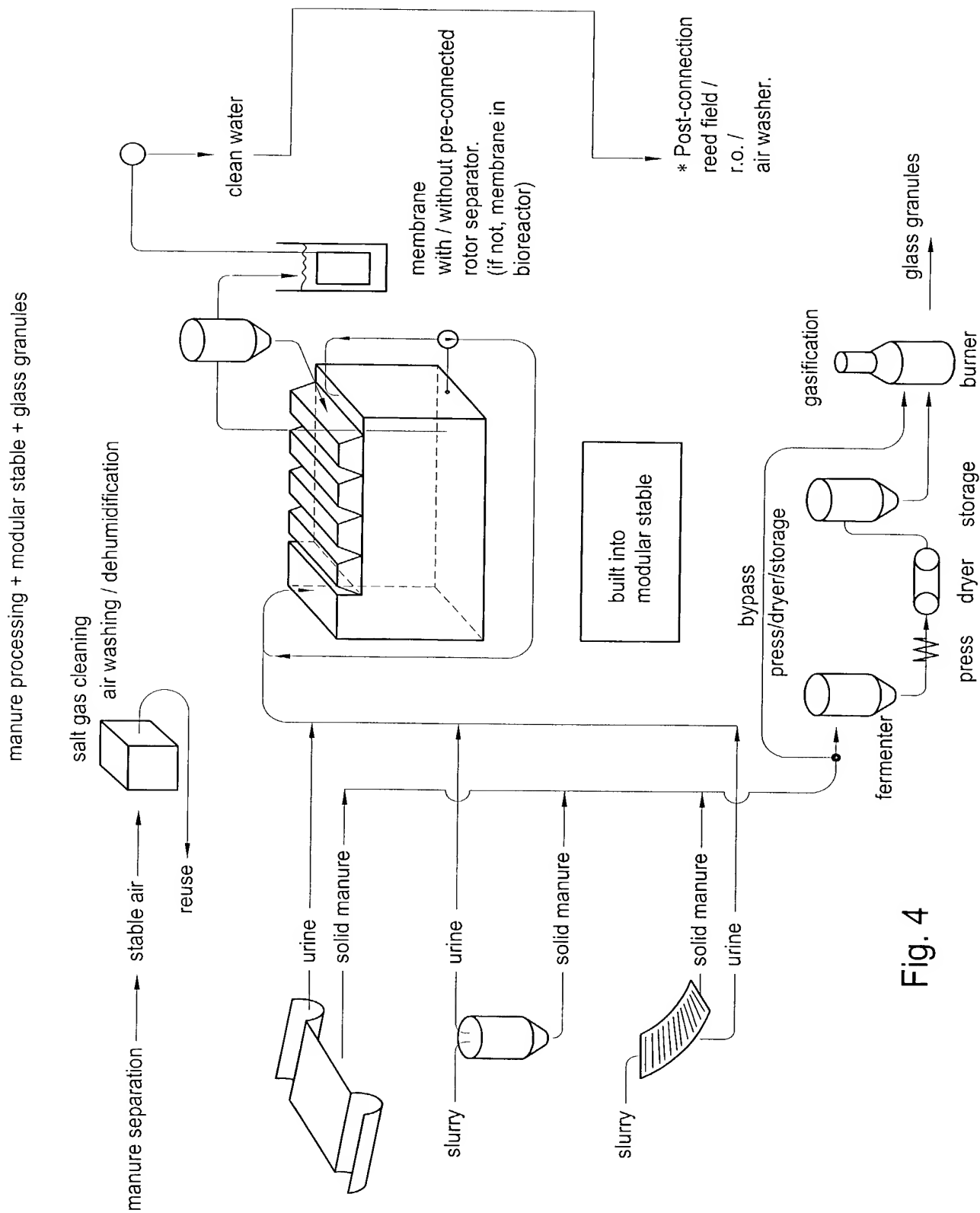


Fig. 4

#5

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I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: "Waste-water purification in cattle-breeding systems".

the specification of which

- ☐ is attached hereto
- ☒ was filed on March 19, 2002, as application serial no. 10/088,579 and or PCT International Application number PCT/NL00/00669 and was amended on (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

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[illegible]

MERCHANT & GOULD P.C.  
P.O. Box 2903  
Minneapolis, Minnesota 55402-0903  
United States of America

Full Name of Sole or First Inventor		
Family Name <u>van der Wijngaart</u>	First Given Name <u>Adriaan</u>	Second Given Name <u>Johannes Hubertus</u>
Residence and Citizenship		
City of Residence <u>Prinsenbeek</u>	State or Country of Residence <u>the Netherlands NLX</u>	Country of Citizenship <u>the Netherlands</u>
Post Office Address		
Street Address <u>Kapelstraat 40</u>	City <u>Prinsenbeek</u>	State & Zip Code or Country <u>4841 GJ</u>
Signature of Inventor 		Date <u>22-04-2002</u>

## Power of Attorney

Katherine M. Kowalchyk	36,848
Paul E. Lacy	<u>38,946</u>
James A. Larson	<u>40,443</u>
Andrew J. Leon	<u>46,869</u>
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